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IN-SITU REAL-TIME MONITORING TECHNIQUE AND APPARATUS FOR  
ENDPOINT DETECTION OF THIN FILMS DURING CHEMICAL/MECHANICAL  
POLISHING PLANARIZATION

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of and claims priority to U.S. Application Serial No. 07/996,817, filed on December 28, 1992, <sup>NOW US 6,614,529</sup> the entirety of which is incorporated by reference.

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FIELD OF THE INVENTION

The present invention is directed to a technique and apparatus for the optical monitoring and measurement of a surface undergoing rotation, particularly for in situ, real-time monitoring of any thin film undergoing rotation and simultaneous dimensional changes. 10 It is particularly useful in the field of wafer planarization for producing wafers of extreme flatness and uniformity that are desirable in the production of semiconductor and integrated circuits.

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BACKGROUND OF THE INVENTION

15 As microelectronic device dimensions continue to shrink, patterning problems increasingly hinder integrated circuit and semiconductor device fabrication. Semiconductor device fabrication often requires extremely planar surfaces and thin films of precise thicknesses. The surfaces requiring planarization and thickness control in semiconductor devices include areas or layers of dielectric material (such as SiO<sub>2</sub>) on the surface of semiconducting materials and other device pattern layers. The insulating dielectric layers and other device layers need to be extremely planar because irregularities and rough topography lead to fabrication problems, including Depth of Focus budget (hereafter DOF) problems. 20 Since an irregularity in the surface can cause part of the surface to be out of focus at a particular distance between the optical system and the wafer, errors in pattern formations can occur. Also, the thickness of layers needs to be precisely controlled because variations in thickness may affect the electrical properties of the layers and adjacent device patterns, particularly in the interconnections between the different layers of microelectronic devices. 25

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